

Species Listing PROPOSAL Form:

Listing Endangered, Threatened, and Special Concern Species in Massachusetts

Scientific name: *Dactylorhiza viridis*, (L.) R.M.Bateman, Pridgeon & M.W.ChaseCurrent Listed Status (if any): Watch-list as *Coeloglossum viride*Common name: Bracted Green Orchid, Frog OrchidProposed Action:☒ Add the species, with the status of:Endangered☐ Remove the species☐ Change the species' status to: _____

Change the scientific name to: _____

Change the common name to: _____

(Please justify proposed name change.)

Proponent's Name and Address:

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Association, Institution or Business represented by proponent:

Natural Heritage and Endangered Species Program

Proponent's Signature:



Date Submitted:

7-25-2023

Please submit to: Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581

Justification

Justify the proposed change in legal status of the species by addressing each of the criteria below, as listed in the Massachusetts Endangered Species Act (MGL c. 131A) and its implementing regulations (321 CMR 10.00) and provide literature citations or other documentation wherever possible. Expand onto additional pages as needed but make sure you address all of the questions below. The burden of proof is on the proponent for a listing, delisting, or status change.

- (1) **Taxonomic status.** Is the species a valid taxonomic entity? Please cite scientific literature.
YES. The name *Dactylorhiza viridis* was first published in Lindleyana 12: 129 (1997) (POWO 2023). It had previously been recognized as *Coeloglossum viride*, which is now considered a synonym. The name *Coeloglossum viride* (L.) Hartm. was first published in Handb. Skand. Fl.: 329 in 1820.
- (2) **Recentness of records.** How recently has the species been conclusively documented within Massachusetts?
The most recent observations of this species were in 2013 in Bernardston and West Brookfield. There have been only three other reported observations in the past 25 years.
- (3) **Native species status.** Is the species indigenous to Massachusetts?

YES. It is indigenous to Massachusetts. Cullina et. al. 2011 considered it native. There is a specimen of this species in the Oakes Ames collection at Harvard University herbaria which date to 1860.

- (4) **Habitat in Massachusetts.** Is a population of the species supported by habitat within the state of Massachusetts?

YES. It is supported by rich, mesic woods, often on slopes.

- (5) **Federal Endangered Species Act status.** Is the species listed under the federal Endangered Species Act? If so, what is its federal status (Endangered or Threatened)

NO. This species is not listed in the Federal Endangered Species Act.

(6) Rarity and geographic distribution.

(a) Does the species have a small number of occurrences (populations) and/or small size of populations in the state? Are there potentially undocumented occurrences in the state, and if so, is it possible to estimate the potential number of undocumented occurrences?

There are only 5 current confirmed populations in the state in the NHESP database. *D. viridis* was previously known from several sites in central and western Massachusetts where it has not been re-located. The size of the historical populations is unknown unless there were multiple collections from the same site. The most recent observations have been of 1 to 6 plants at a time in one place. It is likely that there are additional populations in western Massachusetts, though few populations are expected to be found as it has not been observed since 2013.

(b) What is the extent of the species' entire geographic range, and where within this range are Massachusetts populations (center or edge of range, or peripherally isolated)? Is the species a state or regional endemic? ***D. viridis* is known from North Carolina west to Arizona and north to Yukon and Northwest Territories Provinces in Canada, then extending east to Newfoundland. Many states list it as Critically Imperiled (S1), including Connecticut, New York, and Pennsylvania in the Northeast. Vermont lists it as Imperiled (S2), while New Hampshire lists it as Vulnerable (S3). Most of Canada lists it as Apparently Secure (S4). Based on the map available in NatureServe Explorer (accessed 1/23/2023), it is a more northern species with many states from Massachusetts to Washington state south considering it Imperiled or Critically Imperiled. It is not a state or regional endemic.**

(7) Trends.

(c) Is the species decreasing (or increasing) in state distribution, number of occurrences, and/or population size? What is the reproductive status of populations? Is reproductive capacity naturally low? Has any long-term trend in these factors been documented?

In Cullina et al., 2011, *Coeloglossum viride* was ranked as S2S3, and known historically from all the western counties in Massachusetts west from and including Worcester, as well as Norfolk and Middlesex. In the last 25 years, plants have been reported in only 5 locations. Only a few plants were observed at each location. A re-evaluation of the species rank puts it as S1 in Massachusetts. In a 3000-hour fieldwork survey of all 26 towns in Franklin County, the species was not found in only 1 town; it was previously known from 13 towns in Franklin County (Bertin et al 2020). Similarly, it was observed in only one town in the extensive survey of Worcester County, where it previously was known from 3 towns (Bertin and Rawinski 2012). Searcy 2008 did not find any plants in her extensive survey of the Mount Holyoke Range. Finally, Lovejoy 2008 did not relocate any plants in his extensive surveys in Springfield MA.

(8) Threats and vulnerability.

(d) What factors are driving a decreasing trend, or threatening reproductive status in the state? Please identify and describe any of the following threats, if present: habitat loss or degradation; predators, parasites, or competitors; species-targeted taking of individual organisms or disruption of breeding activity.

The exact causes of this species decline are not known. GoOrchids.org (2023) states that the pollinators of this orchid in North American are not known and notes the species might rely on self-fertilization (autogamy). This circumboreal species is thought to be pollinated by Coleoptera (beetles) and Hymenoptera (sawflies, wasps, bees, and ants) in some European populations. Ants were determined to be the primary pollinator of this species in the Dolomites in Italy (Claessens and Seifert, 2018).

As an orchid, it relies on mycorrhizae for its seed germination, protocorm formation and growth into a seedling, and possibly throughout its entire life cycle. If there has been a decline in its preferred fungal associate, it could cause a decline in this species. However, Jacquemyn et al. (2016) determined that the mycorrhizae associate(s) of *Dactylorhiza viridis* are in Ceratobasidiaceae. That mycorrhizae genera is considered a generalist so *D. viridis* is unlikely to be constrained by the absence of appropriate mycorrhizae.

As this species is mainly listed as “Imperiled” if it has been assessed in the southern portion of its range, and the northern populations are listed as “Apparently Secure,” the decline in this species may be a result of some aspect of climate change.

It has been found in a variety of habitats in Massachusetts, including wetlands, forests, and talus slopes. It prefers moist habitats, which are plentiful in the state.

Causes of decline could include, but are not limited to, deer herbivory (Knapp and Wiegand 2014), earthworms (McCormick et al. 2013), lack of disturbance (Sheviak 1990), nitrogen deposition (Figura et al. 2020), and canopy closure (Brumback et al. 2011, Whigham et al. 2021), all of which affect orchids in Massachusetts. Other specific threats include changes in climate, which might cause a disassociation with its pollinators.

In addition, an increase in invasive plant species which shade plants is also a threat. Other specific threats are not known.

(e) Does the species have highly specialized habitat, resource needs, or other ecological requirements? Is dispersal ability poor?

The known habitats are not uncommon in the state. The plant has been found in a variety of different habitats, including wetlands, rich mesic forests (a rare community), and on talus slopes. Orchids typically produce hundreds to thousands of seeds per capsule, which are easily transported via wind to new locations far and near.

Conservation goals.

What specific conservation goals should be met in order to change the conservation status or to remove the species from the state list? Please address goals for any or all of the following:

(a) State distribution, number of occurrences (populations), population levels, and/or reproductive rates

For *Dactylorhiza viridis* to be down-listed to Threatened, there should be at least 25 separate populations in the state, of which at least one third (8) are considered excellent or good, with population numbers averaging at least 50 healthy, vigorous plants over 5 years.

For *Dactylorhiza viridis* to be down-listed to Special Concern, there should be at least 50 separate populations in the state, of which at least 18 are considered excellent or good, with population numbers averaging at least 50 healthy, vigorous plants over 5 years.

For *Dactylorhiza viridis* to be removed from the MESA list, there should be at least 100 separate populations in the state, of which at least 30 are considered excellent or good, with population numbers averaging at least 50 healthy, vigorous plants over 5 years.

(b) Amount of protected habitat and/or number of protected occurrences

Of the five most recent observations, only 2 are located on protected land. To maintain this species as part of the bio-diversity of Massachusetts, all five of these populations should be on protected land. If any new populations are found not on protected land, the property should be considered for protection.

(c) Management of protected habitat and/or occurrences

It is not known what management this species needs. It is suspected that some disturbance is needed, but exactly what is unknown. More research is needed.

Literature cited, additional documentation, and comments.

Bertin, Robert and Thomas Rawinski. 2012. Vascular Flora of Worcester County, Massachusetts. Special Publication of the New England Botanical Club.

Bertin, Robert I., Matthew G. Hickler, Karen B. Searcy, Glenn Motzkin, and Peter P. Grima. 2020. Vascular Flora of Franklin County, Massachusetts. Special Publication of the New England Botanical Club.

Brumback WE, Cairns S, Sperduto MB, Fyler CW (2011) Response of an *Isotria medeoloides* Population to Canopy Thinning. *Northeastern Naturalist* 18:185–196. <https://doi.org/10.1656/045.018.0205>

Claessens, Jean, and Bernhard Seifert. 2018. Ant Pollination of *Dactylorhiza viridis*. *Orchid Digest*, July, August, September 2018; pp. 154 – 158.

Cullina, Melissa Dow, Bryan Connolly, Bruce Sorrie, and Paul Somers. 2011. The Vascular Plants of Massachusetts: A County Checklist, First Revision. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.

Figura T, Weiser M, Ponert J (2020) Orchid seed sensitivity to nitrate reflects habitat preferences and soil nitrate content. *Plant Biology* 22:21–29. <https://doi.org/10.1111/plb.13044>

Go Orchids web application. <https://goorchids.northamericanorchidcenter.org/species/dactylorhiza/viridis/> (Accessed: January 23, 2023)

Herbarium specimen data provided by: NEBC Herbarium (at the Harvard University Herbaria) and University of Massachusetts Amherst, Herbarium (Accessed through the Consortium of Northeastern Herbaria web site, www.neherbaria.org, 2023-02-20)

Jacquemyn, Hans, Michael Waud, Vincent Merckx, Rein Brys, Daniel Tyteca, Mikael Hedren and Bart Lievens. 2016. Habitat-driven variation in mycorrhizal communities in the terrestrial orchid genus *Dactylorhiza*. *In* *Scientific Reports*. November, 2016

Knapp WM, Wiegand R (2014) Orchid (Orchidaceae) decline in the Catoctin Mountains, Frederick County, Maryland as documented by a long-term dataset. *Biodivers Conserv* 23:1965–1976. <https://doi.org/10.1007/s10531-014-0698-2>

McCormick MK, Parker KL, Szlavecz K, Whigham DF (2013) Native and exotic earthworms affect orchid seed loss. *AoB PLANTS* 5:plt018. <https://doi.org/10.1093/aobpla/plt018>

NatureServe. 2023. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available <https://explorer.natureserve.org/>. (Accessed: January 23, 2023).

POWO (2023). “Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.plantsoftheworldonline.org/> Retrieved 20 February 2023.” <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:998314-1>

Searcy, K. B. 2008. Vascular Flora of the Greater Mount Holyoke Range, Hampshire County, Massachusetts

Sheviak CJ (1990) Biological considerations in the management of temperate terrestrial orchid habitats. *New York State Museum Bulletin* 471:194–196

Whigham D, McCormick M, Brooks H, et al (2021) *Isotria medeoloides*, a North American Threatened Orchid: Fungal Abundance May Be as Important as Light in Species Management. *Plants* 10:1924. <https://doi.org/10.3390/plants10091924>